GRAMELOGIA

OR, (6)

The Mathematicall Ring.

Shewing (any reasonable Capacity that hath not *Arithmeticke*) how to resolve and worke all ordinary operations of *Arithmeticke*.

And those which are most difficult with greate facilitie : The extraction of Roots, the valuation of Leases, &c. The measuring of Plaines and Solids.

With the resolution of Plaine and Sphericall TRIANGLES.

And that onely by an Ocular Inspection, and a Circular Motion.

by Rich. Delamain.

Naturæ secreta tempus aperit.

To

Moſt

eies,
in dev
ſchool
ſibles
zony,
and b
Ages
the q
not t
uſe, a
work
ſerv
danc
ever
graci
that
pray
Perſo

To the High and Mighty King

CHARLES
King of Great Britaine.

Most excellent Majesty,

SInce the perfection of things stand in their use, and the best are ever most usefull, and that there is no kinde of *Learning* that doth more *acuate*, and *stirre* up *generous* and noble mind to *solid* and *eminent* affaires, than doth the *Mathematicall* Studies, yeelding such lightsomnesse, and pleasantnesse to the affectionate in *demonstring* the cause of things, which seeme great *secrets* in Natures *schoole*, that in darknesse *Light* is had, *Ponderosities* way nought, and invisibles appeare; the utility and excellency of *Arithmeticke, Geometry, Astronomy, Navigation, Fortification, &c.* Hence by many *Magnanimous Princes*, and heroicall spirits they have beene imbraced with great affection in all *Ages*; who have taken speciall notice, made most use, and accepted of the quickest and easiest waies in the operation of those *Arts*. Why may not then my *Grammelogia* flie to your *Sacred Patronage*; seeing it is so fit for use, and so excellent to helpe the weaknesse of *Memorie*, that it is able to worke and resolve more *Mathematicall Questions* (in respect of ordinary service) and that with farre greater ease, and without any other dependance, as well on *Horse backe* as on *Foot*, than by any Invention whatsoever, and that only by an *Ocular inspection*. I crave therefore your most gracious Majesty to accept this (though small) pledge in lieu of part of that dutifull service I owe your *Sacred Majesty*; and I will never cease to pray to the supreme *King of Kings* long to preserve your *Majesties Royall Person*, in all felicity in this life, and eternally in all blisse in that to come.

Your Majesties most devoted subject,

R. DELAMAIN

To the Reader.

HAving for many yeares taught the *Mathematicks* in this Towne, and therein seeing the copiousnesse of that *Study*, the excellency of the ends, and the ingenious inventions of many men in that kinde, amongst which *Neper* Baron of *Marchiston* (worthy of all praise) hath not beene the least in the production of that admirable and never too much praised worke of *Logarithmes*, by which, great, laborious, and difficult operations in *Mathematicall Practises* are made facile, when the *Logarithmes* of the *Numbers* of a *Question* are taken out of the Tables of *Logarithmes*, and so accommodated that by *Addition* or *Subtraction*, or by both, the *Logarithme* of the *Answer* is had: notwithstanding in this so great an ease (in comparison of ordinary operation) in every single *Question* there is much time spent in the search of the *Logarithmes* of *Numbers*, or the *Number* belonging to a *Logarithme*, and often time a failing and error in the search thereof, to such which are not well acquainted with those Tables: for expedition in ordinary service, *Master Gunter Professor of Astronomy in Gresham College* (my worthy Tutor) disposed the *Logarithmes* in a double situations upon a scale, and so with a paire of *Compasses* made it fit for operation; (a worke worthy of much praise) since his death I have much endevoured with my selfe how the great body of *Logarithmes* might be so compacted, that every number might have his *Proportionall Number* to a divers or variable proportion, (this I found at the first very difficult) and herein concluded, that it could not be accomplished by placing of numbers one by another in proportion (which to fit to all proportions would breed confusion) but by some *Motion*, so that the whole body of *Logarithmes* might move proportionally the one to the other, as occasion required. This conceit in *February* last I stucke upon, and so composed my *Grammelogia* or *Mathematicall Ring*; by which only with an circular inspection, there is had at one instant all *proportionalls* through the said body of *Numbers* (to a proportion assigned) that as soone as a *Question* is proposed (in ordinary affaires) the *Answer* is had, and not in that only, but in all other numbers which depend upon the like proportion. And here note that this Invention tends not to the curiosity of Numbers in calculation, but for expedition and facility, for which end I composed it (seeing that few men in these times will take paines) in which, pag. 3. evidently appeares, in proportionating the *Fort* to the *Fort*, or the *Building* to the *Building*; in Feet, the answer is alwaies Feet, and the parts of Feet, which is sufficient for *Practise*: so in pag. 20. is demanded what a lease of 30. li. *per annum* is worth for 12. yeares to bee sold for ready money: the answer for which, and others in that kinde, is ever within a unity, which is sufficient for *Buyer* or *Seller* to conclude upon, and so in other matters; as thorow the whole body of *Arithmeticke*, I have in some part dilated on in this following Treatise. And here note, that the Figures which are separated from other Figures with a point, are fractionall numbers, and are the parts of 1. divided into 10. or 100. parts, as thus, 26 5. that is, 26. and 5. parts of 1. that 1. being divided into 10. parts, which is a halfe: if it were 26. li. 4. I would expresse it thus, 26. li. foure tenths of a pound, that is 8.s. for that 1. being supposed to be 10. parts, it represents the parts of the pound, therefore 4. parts shall be 8 s. as before, &c.

Such as desire helpe herein, in the *Arithmeticall* worke, in the *Logarithmeall* way, or in the *Demonstration* of any thing therein, may be assisted by the *Author* (God permitting life) and not in this only, but in any other part of the *Mathematicall Studies*; so I rest a lover of such that love all laudable qualities.

From my house in Chancery Lane,
the first of January, 1630.

Of the description of the Grammelogia,

first how to number thereon, which being not fully understood, all the ensuing matter will seeme difficult. Note therefore this direction with diligence, for then all the Treatise thereon will bee most plaine, such, that the like, for expedition and facility, hath never beene produced.

He parts of the Instrument are two Circles, the one moveable, and the other fixed ; The moveable is that unto which is fastened a small pin to move it by ; the other Circle may be conceived to be fixed : The circumference of the moveable Circle is divided into unequall parts, charactered with figures thus, 1.2.3.4.5.6.7.8.9. these figures doe represent themselves, or such numbers unto which a Cipher or Ciphers are added, and are varied as the occasion falls out in *the speech of Numbers*, so 1. stands for 1. or 10. or 100. &c. the 2. stands for 2. or 20. or 200. or 2000. &c. the 3. stands for 30. or 300. or 3000. &c.

If the figure of 1. stands but for 1. then all the divisions in the Circle are the parts of 1. so the figure of 4. stands for the fourth of 1, if 1. be divided into 10. parts, or the 4. stands for 40. parts of 1. (if 1. be divided into 100. parts) 8. stands for the eighth part of 1. &c.

Secondly, if the figure of 1. stand for 10. then the figure of 2. stands for 20. the 3 for 30. &c. hence it followeth, that betweene the figure of 1. and the figure of 2. or betweene 2. and 3. must be 10 divisions to represent the intermediate numbers, the middle of those divisions is noted thus ·i· as if the 2. be 20. and the 3 be 30. then the next great division beyond the figure of 2. you may account 21. two divisions beyond the figure of 2. to be 22. the next great division you may account 23. and so on, numbring till you come to 30. or any other number, which division noted thus ·i· is only to helpe the memory in numbring.

Thirdly, if the figure of 2. stand for 200. then the figure of 3. is 300. the figure of 4. is 400. hence there must be 100. betweene 200. and 300. and 100. more betweene 300. and

400.

400. and so of others: now seeing that ten tens make an hundred, there must be 10. divisions betweene the said 200. and 300. every one of those divisions doe represent 10. so the said note ㅜ shall be halfe of the said 100. therefore at that note you may reade 250. and the middle betweene 300. and 400. 350. 450. &c.

Every one of the divisions which stand for 10. is divided into 10. other divisions, the middle of which hath its division a little higher than the rest, to helpe the memory to number more readily.

And here generally is to be noted, that what Denomination you give unto any of the Figures, the next great division is the next subdenomination, and the next lesser division to that greater, is the second subdenomination, as if I should speake 243. here the denominations are *Hundreds, Tens, Vnites,* the figure of 2. shall stand for 200. the foure great divisions next the 2. shall be 40. and the next three small divisions shall represent 3. which is within seven small divisions of 4. and so of others.

Thus for the *Description* and numbring on the moveable Circle. The numbers and divisions on the fixed Circle, are the very same that the moveable are, and therefore the same numbers are in the fixed that are in the moveable, for if you move 1. in the moveable to 1. in the fixed, there is represented to every number, or division, his opposite.

And thus in these two Circles, there is a great body of *Numbers*, the one standing alwaies fixed, and the other to be moved ; and if any number in the moveable be moved, all other numbers move with it, so if you move 25. in the moveable, to 30. in the fixed, right against 26. in the moveable, is 31. 1. 10. in the fixed, and right against 27. in the moveable, is 32.4.10. in the fixed, right against 30. in the moveable, is 46. in the fixed, against 46. in the moveable is 55.2 10. in the fixed,

Againe, if 108. in the moveable, be brought to 15. in the fixed, right against 16. in the fixed, is 115 in the moveable, and right against 12 in the fixed, is 86.4.10. in the moveable. Thus what denomination you give unto the numbers in the *Moveable,* according to their successive progresse, you are to keepe the same denomination; the like is to be conceived touching the successive denomination of numbers in the fixed.

How

How to performe the Golden Rule,

or to finde a Proportionall Number unto another Number, as two other Numbers are in proportion amongst themselves.

His Rule of all other is the most excellent and the most generall, as well in *Mathematicall* Calculations, as in Arithmeticall Computations, and therefore may not unfitly be so called, and the *Instrumentall* operation is rather more facile in this Rule, than in *Multiplication* or *Division*; hence it is that I have disposed it in the front of the worke, because of expedition and facility: and the way of operation is thus:

Seeke the first number in the moveable, and bring it to the second number in the fixed, so right against the third number in the moveable, is the answer in the fixed.

Construction

If the Interest of 100. li. be 8. li. in the yeare, what is the Interest of 65. li. for the same time.

Example 1

Bring 100. in the moveable to 8. in the fixed, so right against 65. in the moveable is 5. 2. in the fixed, and so much is the Interest of 65. li. for a yeare at 8. li. for 100. li. *per annum.*

Construction

The *Instrument* not removed, you may at one instant right against any summe of money in the moveable, see the Interest thereof in the fixed: the reason of this is from the *Definition of Logarithmes.*

☞

Proportionales Logarithmi æquales habent differentias.

Definitio.

Necesse est igitur proportionales Logarithmos in proportione lineari distantias æquales habere.

Example 2. *If a Troope of 50. Horse have for their pay 140. li. how much shall suffice to pay a Troope of 64. Horse.*

Construct. o. BRing 50. to 140 then right against 64. in the moveable is, 179. 2. in the fixed, the monthly pay of the said 64. horse. And there immediatly may you see the monthly charge of any number of Horse, for, the number of Horse given in the moveable, right against it, is their pay in the fixed.

Example 3. *It is said that the proportion betweene the circumference of a Circle to his Diameter is 7. to 22.*

Bring therefore 7. in the moveable to 22. in the fixed, then immediatly at one inftant may you have the *Diameter* or *Circumference* of any Circle, only by an ocular inspection: for right against the *Diameter* in the moveable, is the *Circumference* in the fixed; or right against any *Circumference* in the fixed, is his *Diameter* in the moveable: Thus for the simple Rule.

Further uses of the Gal'en Rule in ordinary service in proportionating of things.

Example 4. Let F L X. represent the *Perimeter* of a Pentagonall Fort, and let the distance betweene the points of the Baftines, FL be 926. foot, or KL the square side of a Building 470. foot, and the other dimentions, both of the Fort, and the Building according to the here under inscribed Tables.

The distance betweene the points of the Bulwarke. } F I. 926.
A perpendicular———— C R. 617.
The Cortine———— D N. 662.
The side of the Fort——— A B. 425.
The gorge line———— A D. 119.
The Flanke.———— D E. 100.
The line of defence——— D L. 700.
The face of the Bastine——— E F. 264.
The capitall line ———— A F. 224.
The distance from the Center to the Bastine } A C. 564.
From the Cortine to the Center——— } C I. 456.
The bredth of the Bulwark. G E. 310.

The greateſt ſquare ſide of the Building———KL. 470. fooꝰ

Q. A court within the middle of the Building.

The diſtance betweene the middle of the Court } KA. 236.
and any out angle, as——— ——— ———

The leaſt inner ſquare of the Court———————— EF. 200.

Betweene any out corner of the Building, as—— RX. 180.

o. o. o. &c. a ſtone Gallery in bredth —— ——   36.

And ſo of other under-roomes to other uſes.

NOw admit another like *Fort*, or another like *Building* is to be erected, whoſe greateſt diſtance betweene the aforeſaid points of the Baſtines, can be but 750. foor, or the greateſt ſide of the peece of ground where the *Building* is to bee made, is but 400. foot, what ſhall the ſeverall meaſures of this new *Structure* be, ſo that the *Fort* to the *Fort*, or the *Building* to the *Building*, in all parts be proportionall?

This is performed with much facility and expedition by *Conſtruct.* this *Grammelogia*.

For if you move the whole to the whole, *viz.* 926. to 750. or 470. to 400. right againſt the ſeverall knowne meaſures in the moveable, you have the ſeverall required meaſures in the fixed. I bring therefore 926. unto 750.

So right againſt	In the moveable is	In the fixed	So right againſt	in the moveable is		in fi
637	515. 9.					
662	536. 1.					
425	344. 2.					
119	96. 4.		236	285. 9.		
100	81. 0.		200	170. 2.		
700	566. 9.		180	153. 1.		
264	213. 8.		36	72. 8.		
224	181. 4.					
564	456. 8.					
456	369. 3.					
310	251. 1.					

Theſe numbers found out by the ordinary way of Arith-meticke may trouble a nimble Arithmetician a whole houre or more, and therein ſubject to much error, but others 6. or 8. houres at the leaſt, if not more; but by this *Grammelogia*, they are found out in leſſe time than halfe a quarter of an houre: for ſo quicke is its operation in any *queſtion*, to him that hath the way of working by it, that it gives the *Anſwer* before a man can diſtinctly write downe the numbers propo-ed in the *queſtion*.

Further

*Further uses of the Golden Rule, in matters of
combination of Numbers, how to part
a number into parts, as another
number is already parted.*

1   LEt *A. B. C. D. E.* be five men which adventure money in
a *Plantation* or otherwise: *A.* adventures 84. li. *B* 72. li.
C 48. li. *D.* 54. *E* 42. li. by which in the returne is gotten 50.
li. how much shall *A. B. C. D.* and *E.* have, according to their
severall disbursments.

2   Or admit *F.* borroweth of *A.* 84. li. of *B.* 72. li. of *C.* 48. li.
of *D.* 54. li. and of *E.* 42. li. *F.* dies, and his whole estate is
worth but 50. li. how much shall every Creditor have of this
50. li. according to his money lent,

3   Or suppose *A. B. C. D. E.* were five severall metals, alotted
to make a Statue, Vessell, Bell, &c. *A* Gold, *B* Silver, *C* Co-
per, *D* Latten, and *E* Tin ; now when the Metals were melt
and cast, there was left a peece which weighed 50. li. how
much Gold, Silver, Coper, Latten, and Tin doth it containe,
that so the worth of that peece may be knowne.

4   Or if there were 5. *Companies*, or 5. *Captaines*, *A. B. C. D. E.*
who expect their Pay, to *A* was owing for his service 84. li.
to *B.* 72. li. to *C.* 48. li. to *D.* 54. li. and to *E.* 42. li. Now to
keepe them from mutiny, the Generall sends them 50. li. to
be parted amongst them proportionally according to each
others dues, what shall *A. B. C. D. E.* have ?

5   Or admit *A. B. C. D.* and *E.* should load a ship of 300.
tuns, *A* layes in 84 tuns, *B.* 72. *C.* 48. *D.* 54. and *E.* 42.
tuns; in the voyage by reason of tempest, for safegard of
their lives and Ship, there was cast over boord 50. tuns of
the loading, how much shall *A* beare of the losse, as also
B. C. D. and *E.*

6   Further, in a Shire there is to be raised of 5. men, *A. B. C.*
D. and *E.* 50. li. proportionally according to their estates; *A*
is worth yearely 84. li. *B.* 72. li. *C.* 48 li. *D.* 54. li. and *E.* 42. li.
how much shall each one pay, &c.

THus I might infinitely dilate my selfe upon one subject,
tending to admirable uses, I onely in this glance by
things, making but way to the occasions: The resolution of
which, and all others of this kinde, is drawne from this en-
suing Axiome.

*There is such proportion betweene any whole, and his parts, as
betweene the like whole, either greater or lesser, and his parts: or
betweene the parts and the parts, as betweene the whole and the
whole.*

So in the first example, Adde the money of *A. B. C. D.* and
E. together makes 300. li. this is the whole, the parts are the
former: now 50. li. is another whole number, which must
be broken into parts proportionall to the former; and this
differeth nothing in the operation from that of the last, in
proportionating the Fort to the Fort, or the Building to the
Building: for such proportion as 300 li. the whole money
disbursed hath unto 50. li. the whole money gotten, so shall
184. have to his part, and so of any other.

Bring therefore 300. in the moveable unto 50. in the
fixed, so right against any particular part in the moveable is
his part proportionall in the fixed, as there apparantly is
seene, and from thence they are taken and placed in a Table,
as here under appeares.

$$\text{As 300. to 50. so} \begin{cases} A. & 84. \\ B. & 72. \\ C. & 48. \\ D. & 54. \\ E. & 42. \end{cases} \text{to} \begin{cases} 14. \\ 12. \\ 8. \\ 9. \\ 7. \end{cases}$$

More

More uses upon the Golden Rule, in the
division of Lines.

propositio.1. TO finde a Line that shall keepe any proportion assigned unto another line given.

Declaratio. As, let a Line be found which shall keepe proportion to the line *A*. as 3. to 5.

Constructio. Measure the line *A* by a scale of equall parts, then bring 3. unto 5. so against the measure of the line *A* in the moveable, you have the measure of the line required in the fixed, *viz. B*. so the lines *A* and *B* are in proportion as 3. to 5. &c.

Propositio.2. *To divide a Line into any number of equall parts.*

Declaratio.
Constructio. Let it be required to divide the Line *A* into 23. parts: first, by a scale of equall parts measure the Line *A*, which admit to bee 51. parts, bring then 23. in the moveable unto 51. in the fixed. So right against 1. 5. 10. 15. 20. in the moveable, is 2. and 2. 10. 11. and 1. 10. 22. and 2. 10. 33. and 2. 10. 44. and 3. 10. in the fixed: if these numbers be taken from the same scale, and applied to the line *A*, it will be divided in the points of 1. 5. 10. 15. and 20. then may those parts be easily sub-divided.

Propositio.3. *To divide a Line in such sort or proportion as another Line is already divided.*

Declaratio. Let the Line *B. C.* bee divided in the points, *D. E. F. G.* and *H*. as the Line *R*. is divided.

Constructio. Measure the Line *R*. 58. and his divisions *R*. 12. *R* 15 *R* 30 *R*. 30. *R*. 50. then let *BC*. be measured, which admit it containe 37. parts, bring 51. unto 37. so against the parts of *R* in the moveable, you have the parts of *BC*. in the fixed, *viz. BD. BE. BF. BG.* and *BH*.

Propositio. 4. To finde a line in continuall proportion unto two given lines, or a proportionall line to 3. lines, it differeth nothing from that of Numbers, and therefore wrought accordingly.

Notions or principles touching the di-
sposing or ordering of the Numbers in the
Golden Rule in their true places upon
the Grammelogia, and the congruity
of those Numbers one unto
another.

NOte that in any question of the *Golden Rule*, there are three numbers to worke upon, whereof two of them are of one denomination, the one of them hath his answer, and the other doth require an answer, and those two numbers of like denominations must be alwaies accounted or sought out upon the moveable *Circle*.

As if 30. li. dos rent 45. *Acres of Land yearely, how much doth* Example. *the yearely Rent of 84. Acres come to.*

Here the denominations alike are 45. Acres and 84. Acres, 45. Acres hath his answer, 30. li. and 84. Acres requires his answer.

For the working of this and all others, Let the numbers in the moveable be brought to his answer in the fixed: that is, bring 45. to 30. So, right against the thing demanded in the moveable: that is, against 84. shall be the answer in the fixed, *viz.* 56. and so many pounds will rent yearely the said 84. Acres.

Secondly, note further, that those three numbers as 45. Acres, 30. li. and 84. Acres, are distinguished by numerall attributes, as first, second, and third. Hence of some it is called the rule of three, and the answer to 84. Acres is called the fourth number, which is ever of the same denomination that the second number is of: and the *fourth number* sought for hath alwaie such proportion to the *third number*, as the *second* is to the *fir*: *Vel contra.*

From which by a more generall name, it is called *The Rule of proportion*, for that it proportionateth things unto any proportion assigned; so is the said 56. a proportionall number to 84. as 30. is unto 45. for 56. is two third parts of 84. and so is 30. two third parts of 45.

Therefore these foure numbers, 45. 30. 84. 56. are proportionall numbers one unto another: *And here note generally in* direct proportion, if the *third number* be greater than the *first number*, the *fourth number* shall bee greater than the *second number*.

Contrariwise, if the *third number* be lesse than the *first number*, the *fourth number* is lesse than the *second number*.

But in *Reciprocall proportion* this fourth number is inverted: so if the third number be greater than the first, the fourth number is lesse than the second.

Example 1. So if 45. *men in* 30. *daies, will doe a service, in how many daies* shall 270. *men doe it.*

Here the denominations alike are 45. Men and 270. Men: the answer to 45. men is 30. daies, the answer to 270. men is required.

Construction. If you move 45. in the moveable to 30. in the fixed, right against 270. in the moveable is 180. daies in the fixed: which answer is absurd, seeing there is more men allotted to doe the worke, there must most necessarily be lesse time.

Therefore in all Questions of *Reciprocall proportion*, let the demand bee sought out upon the moveable, viz. 270. and brought to the first numbers answer in the fixed, viz. 30. so right against the first number in the moveable, viz. 45. the answer in the fixed, viz. 5. and in so many daies will 270. men doe that service, if 45. men doe it in 30. daies.

Quest. 2. *Againe, if* 3840. *souldiers are victualed for* 10. *moneths, how many men may it serve that the said provision may last* 12. *moneths.*

Construction. In this and all others (as before) bring the third number 12. in the moveable, to the other numbers answer in the fixed, viz. 3840. so against the first number 10. moneths in the moveable, is 3200. men in the fixed, and so many men will the same provision serve for 12. moneths.

From which direction, those ensuing questions, and the like, may be resolved.

if I lend 140. li. for 7. moneths, if I should borrow of him 200. li. how long might I keepe it; facit 3. moneths and 5. 10.

According to the Statute, if Wheat be at 50. s. the quarter, the penny loafe should weigh 6. ounces and a halfe, what shall it now weigh, if in case wheat be at 3. li. 12. s. the Quarter; the numbers changed into decimals will be thus, if 2. li. 5. 10. give 6. ounces, & 5. 10. what shall 3. li 6. 10. give : facit 4. ounces and 5. 10.

A Gallery is found to containe in the walls 380. yards, how many yards of Tapestry shall hang that Gallery of 7. quarters broad : facit 665. yards.

25. Ounces of 7. yards to an ounce will serve to lace a vesture, how many ounces of 5. yards to an ounce will doe the same, &c. facit 35. ounces.

How to proportion a Fraction that is not Decimall, into a decimall.

So if 8. & 12. 40. were to be used; 12. 40. must be changed into a Decimall, thus : bring 40. in the moveable to 10. in the fixed, so right against 12. in the moveable is 3. in the fixed, so the fraction 12 40. is changed now into 3. 10. so for 8. & 12. 40. you have now 8. and 3. 10. which may be easily found out.

Againe, let 63. 84. bee a fraction which is to be used, this cannot be found out upon the Grammelogia: change it therefore into a Decimall.

Bring therefore 84. (the Denominator) to 100. in the fixed, so 63. (the Numerator) in the moveable, gives 75. in the fixed ; so 63. 84. is now changed into a Decimall 75. 100. the same in value with 63. 84. and so of any other Fraction that is not decimall.

This for Lineary Proportion.

B   Of

*Of the Golden Rule, or Rule of Proportion, in respect of Lines and
Quantities in plaine Figures.*

Pro. 1. IF the demand be of the quantity, *As if the Diamiter of a Circle be 7. and the Area 38. and 5. 10. what is the Area of another
Circle whose Diameter is 18. Foot.*

Constructio. Bring the line knowne to the other line, that is 7. to 18. so
right against 38. and 5. 10. in the moveable is 99. in the
fixed, which looked out in the moveable, right against it in
the fixed is 254. and 5. 10. the Area of that Circle.

*In like manner consider of Squares, Triangles, and
other plaine Figures.*

Pro. 2. *If a peece of Land of 20. Pole square be worth 30. li. what is a peece
of Land of the same goodnesse worth, which is 35. Pole square every way.*

Constructio. Bring 20: to 35. so right against 30. in the moveable you
have 52. and 5. 10. in the fixed; and right against this 52.
and 5. 10. in the moveable you have 91. and 8. 10. in the fixed,
the worth of that land.

Pro. 3. *If a peece of ground of 50. paces square is sufficient to lodge an
Army of 1600. men, how many men shall there be lodged in a peece
of ground which is 40. paces square.*

Constructio. Bring 50. to 40. so right against 1600. in the moveable is
1280. in the fixed, the answer required.

Pro. 4. *Our English land measure is 16. foot and a halfe to the Pole, the
Irish Pole hath 21. foot, how many English Acres doth 30. Irish
Acres make.*

Constructio. Bring 16. and 5. 10. to 21. then right against 30. in the
moveable is 38. and 2. 10. in the fixed, and right against this
38. and 2. 10. in the moveable is 48. and 6. 10. in the fixed,
and so many English Acres is contained in 30. Irish Acres, &c.

☞ Our usuall measures in England to the Pole are 16. foot
and a halfe 18. or 20. foot, the proportion of their squares are
68. 81. 100. I have set their measures to those numbers in the
Grammelogia.

Now if the quantity be given and his measure, and the
quantity be required according to another measure, you may
have it with greater expedition: for bring the measure whole
quantity is required to the other measure, so against the
quantity knowne in the moueable, you have the quantity required in the fixed.

Of

Of the Golden Rule, or Rule of Proportion in respect of Lines, and the quantity of Solids.

SO if in some stately structure the Columes were to bee supported with Cubes of Silver, or other rich Materiall, differing in their quantity, an estimate of their charge might be quickly had; *As admit the side of the least Cube were 4. Inches, and could not be made under 12. li. what might a Cube of the same mettall be worth that is but one inch more in the side, viz. 5. inches.*

Bring 4. to 5. so right against 12. in the moveable, is 15. in the fixed, and right against this 15. in the moveable is 18. and 75. 100. in the fixed, and right against this 18. and 75. 100. in the moveable is 23. li. and 4. 10. in the fixed, and so much will the second Cube cost: *this might bee applied to the weight, worth, or quantitie of other Solids.*

A Peece of 5. Inches boare or Diameter, requires for her charge 16. pound of Powder, what quantity of Powder will serve another Peece of 4 Inches in the boare.

Bring 5. to 4. so right against 16. in the moveable is 12. and 8. 10. in the fixed, and right against 12. and 8. 10. in the moveable is 10. and 24. 100. in the fixed; and right against this 10. and 24. 100. in the moveable is 8. and 2. 10. in the fixed: the answer of Powder according to Cubick proportion, but Canoniers doe somewhat qualifie this proportion.

To finde what Proportion in Quantity there is betweene two or more Solids.

There are two Bullets, Globes, or Cylenders, the Diameter of the one is 10. inches, and the other the Diameter is 4. inches, what proportion is there betweene the Solids, or how often doth the greater containe the lesser.

Bring 10. to 4. so right against 100. in the moveable is 40. in the fixed, against this 40. in the moveable is 16. in the fixed; and right against this 16. in the moveable, is 6. and 4. 10. in the fixed; so the proportion betweene the Solids are as 100. to 6. and 4. 10.

But how often the greater doth containe the lesser, the Rule ensuing doth teach.

How

How to divide one number by another.

Pro. 1.

Constructio. Move the Divisor to 1. so right against the Dividend in the moveable, is the quotient in the fixed.

Declaratio. So if it were demanded, how many daies there is in 216. houres, because a day naturall containes 24. houres, that therefore is the Divisor. Move then 24. to 1. and right against the said 216. in the moveable is 9. in the fixed, and so many daies is 216. houres.

☞ Here note that in all *Divisions*, by how many figures or places the Dividend exceeds the Divisor, so many places or figures shall the *Quotient* have. But if the figures of the Divisor may be taken from as many of the first figures or places towards the left hand of the *Dividend*, then the *Quotient* shall have one place more.

Example 2. So if it were further required, how many daies there were in 360. houres, or any other number: the Instrument not moved from his first setting, they are all given at one instant: for right against the number in the moveable, is the answer in the fixed, so right against 360. in the moveable is 15. in the fixed, and so many daies are there in 360. houres.

This note serves onely to know the number of Figures or places in the Quotient, by which the denomination of the first figure of the Quotient may be had.

Example 3. So if it were demanded how many yeares there is in 14600. daies, there being 365. daies in the yeare: this therefore is the Divisor. Bring then 365. to 1. so right against 14600. in the moveable is 4. in the fixed, but by the former note ☞ it must be 40. and so many yeares is there in 14600. daies, the Instrument not moved, right against any number of daies, as 5000. 10000. 20000. &c. in the moveable, is the yeares in the fixed. With the same expedition and facility may you divide by fractionall numbers.

Further

Further uses upon Division.

IN a yeare are 52.weeks or 365.daies. If I would know the weekly *Example 4* expences of any yearely summe of money.

Bring 52. to 1. then right againſt any ſumme of money in *Conſtructio* the moveable, you have the weekly expences in the fixed:

But if you move 365. to 1. then right againſt any ſumme of money in the moveable, you have the daily expences in the fixed.

So if the expences yearely were 1000. li. or the charge of a *Declaratio.* certaine Company of Souldiers: right againſt it according to the note ☞ of Diviſion is 2. li. 7. 10. the daily charge: the Inſtrument not removed, you may ſee at one inſtant the daily charge of 20000.li.a yeare, 50000.li.or 100000.li.a yeare: for right againſt the charge or expence in the moveable, is the anſwer in the fixed.

More uſes upon Diviſion.

It is ſaid that Land is bought after the rate of 14. yeares *Example 5* purchaſe: if 14. be therefore brought to 1. right againſt any ſumme of mony in the moveable, you have the Annuall Rent in the fixed anſwerable to that money. And thus you have lying before you a whole Circularity of Numbers, by which at one inſtant, doe but ſpeake the ſumme of money, right againſt it is his Rent.

But if the Rent were given and the Purchaſe required, it is the inverſe of this, and is proper to Multiplication, and the Rule followeth in the next page.

Other uſes upon Diviſion to finde the Scale to divide the Meridian line in a Sea Chart, according to any bredth, & to a Latitude aſſigned.

Let the bredth of the Chart extend from the Latitude of *Example 6.* 30. unto 40. the degrees of the Equator anſwerable to the difference of thoſe Latitudes, according to M. *Wrights* projection, are 12. & 24.100. Bring this 12. & 24.100. to 1. ſo right againſt the bredth of the Card in the moveable, you have the Inches, or parts of Inches in the fixed to make your ſcale by to divide the Meridionall line.

So if the bredth of the Card were 33. Inches, right againſt *Declaratio.* it in the fixed is 2. Inches, 7. 10. the largeneſſe of a degree of the Equator: if the bredth were 24. & 5. 10. right againſt it is 2. Inches: if 20. & 8.10. then the bredth of a degree is 1. & 7.10. if 14. & 7.10. then 1. & 2.10. if 8.& 5.10. then 7. 10.&c.

To multiply one Number by another, or to finde the Product of two Numbers.

Construction. MOve 1. to the multiplier, then right against the Multi-cand in the moveable Circle, you have the Product in in the fixed Circle.

☞ Here note that the Product of any *Multiplication*, is ever as many figures or places, as there are places or figures con-tained in the *Multiplicand* and *Multiplier*, if the two first Fi-gures towards the left hand being multiplied together have excrescence (that is, if the Product exceed 9) otherwise the Product shall bee one figure or place lesse than there are fi-gures or places contained both in the *Multiplicand* and *Mul-tiplier*.

Declaratio. So if 38. be multiplied by 2. the Product will be but two places: But if the said 38. be multiplied by 5 the Product will be three places, for that 3 by 2. multiplied doth not crescere, but the said 3. by 5. doth beare excrescence, *viz* more than 9.

This Note is only to give domination to the first figure of the Product towards the left hand, for if the Product have two figures, then the first figure of that Product towards the left hand is ten or tens; if the Product have three figures, then the first figure of the Product towards the left hand is hundreds, &c.

Example 2. To Multiply 18. by 5. Bring 1. to 5. then right against 18. in the moveable is 9. in the fixed, which by the former note ☞ or observation is 90. which is the Product of 18. by 5.

But if 35. were to be multiplied by 4. move 1. to 4. so right against 35. in the moved is 140. by the last note ☞.

Example 3. To multiply *Fractionall*, as 40. and 5. 10. by 7. and 3. 10. Bring 1. to 7. and 3. 10. so right against 40. and 5. 10. in the moveable is 295. and 5. 10. in the fixed; the Product required. So to multiply 8. 10. by 4. 10 Bring 1. to 5. 10. so right against 8. 10. in the moveable is 4. 10. in the fixed.

Use

Vses upon Multiplication.

12. *Moneths make a yeare, bring* 1. *unto it, so right against any* Example 3. *monethly expences in the moveable you have the yearely expences in the fixed, according to the note* ☞ : So if the monethly expences were 75. li. right against it in the fixed is 9. which by the former note ☞ makes 900. if 150. li. for a moneth, right against it in the fixed is 1800. li. the yearely charges or expences.

Other uses upon Multiplication.

60. *Minutes make an houre,* bring 1. to 60. so right against Example 4. any number of houres in the moveable is the minutes of those houres in the fixed.

Further upon Multiplication.

Admit lands be sold at 14. *yeares Purchase,* bring 1. to 14. so Example 5. against any Rent in the moveable you may at one instant see the purchase thereof in the fixed, having regard to the former note ☞ .

How to square a Number.

To square 18. bring 1. to 18. so right against 18. in the Example 6. moveable is 324. in the fixed, the square of the said 18. In like manner may you square whole numbers and fractions, as to square 13. and 5. 10. *facit* 182. and 25. 100.

How to Cube a Number.

As to Cube 6. and 2. 10. bring 1. to 6. and 2. 10. so right Example 7. against 6. and 2. 10. in the moveable is 36. and 4. 10. in the fixed, and right against 36. and 4. 10. in the moveable is 216. - in the fixed, the Cube of 6. and 2. 10.

Againe to Cube 6. bring 1. to 6. for right against 6. in the moveable is 36. in the fixed ; and right against this 36. in the moveable is 216. in the fixed, the Cube of 6, &c.

To finde Numbers in continuall proportion unto any two Numbers assigned.

Constructio.
Bring the first number to the second, then right against the second upon the moveable, is the third number in the fixed, and against this third number in the moveable, is the fourth number in the fixed, &c.

Declaratio.
So if the numbers to be continued in proportion be 2. to 4. move 2. to 4. so right against 4, in the moveable is 8. in the fixed, and 8. in the moveable gives 16. in the fixed, and those numbers, 2.4.8.16 &c are said to be in continuall Proportion.

Example 2.
Againe, if I would continue a Proportion, as 2. to 3. move 2. to 3. then 3. in the moveable shall point out 4. & 5. 10. in the fixed, and 4. & 5. 10. in the moveable shall give 6 & 7. 10. in the fixed, and so on (if need were) to finde others: and those numbers are said to bee in continuall proportion one unto another.

☞ The increase or interest of *Money* from this ground is easily found, seeing the increase of the *Money* must bee in continuall Proportion to the Principall, as 100. li. is to his Interest.

Example 3.
As if the Proportion were to be continued to 40. li. as 100. to 108.

Constructio.
Move 100. to 108. then against 40. in the moveable is 43. li. 2. 10. in the fixed: the first yeares Interest and its Principall, & against this 43. li. 2. 10. in the moveable, is 46. li. 8. 10. in the fixed, which is the seconds yeares Principall and Interest: in like manner may you proceed to other yeares.

☞ The *Instrument being at this stay,* the eye may denote out at one instant the Interest of any summe of Money: for right against your number in the moveable, is both Principall and Interest in the fixed.

Example 4.
As if it were 27. li. 14. s. (that is, 27. li. 7. 10) right against it is 30. li. *fere,* and so much doth 27. li. 14. s. come to at the yeares end, and so all other summes of money doe offer themselves at one instant to the eye in their resolutions.

To finde a meane proportion betweene two numbers.

NOte if the two *Numbers* have like places, or exceed one
another by two places, move the numbers to and fro,
untill 1 in the fixed be equally diftant betweene them, which
the divifions in the pricked Circle *A B* will helpe you; fo right
againft 1. in the fixed, is the mean proportió in the moveable.

If the two n mbers exceed one another by one, or three pla-
ces, move the numbers to and fro, untill 1. in the fixed bee
equall diftance betweene them; fo right againft *B* in the
moveable is the meane Proportion.

Some uſes upon meane Proportionals.

To find how much is taken in the 100. li. in Loane of mony.
If 40. li *be lent for two yeares, and at the end thereof were recei-*
ved 48. li. and 4. 10. what was taken in the 100.

Finde a meane proportion betweene 40. and 48. 4.10.
which will be 44 according to the laft rule; fo right againft
48. 4. 10. in the moveable, is 110. in the fixed, which is the
Principall and its Intereft; fo ten pound is taken *per centum.*

Pro. 2. *In warlike difcipline, the weakeſt place oppoſed to danger, is*
ſupplied with ſtrongeſt force.

Now there are two companies allotted for two feverall
fervices, the one containing 500. Souldiers, the other 320.
Souldiers, there is a third place, neither fo ftrong as the lat-
ter, nor fo weake as the former, therefore a meane number
of Souldiers is thought convenient for the defence thereof:
what number fhall it be?

Finde a meane proportion betweene 500. and 320. *facit*
400. and this is a meane proportionall number betweene
320. and 500. and the number of men required.

Pro. 3. *To finde the Scale that protracted a Plot or Building by.*
Let the Rectangle *A C* be 8. *Acres, and let the Scale be ſought for*
by which it was protracted or plotted: With any
Scale meafure the fide *A B.* admit of 10.
parts in an inch, and fuppofe it make 33. &
33. 100. parts, and *A D.* 26. & 66. 100. parts,
according to which the *Area* of the Rectangle now is 5. *Acres*
and 56. 100. parts; finde a meane proportion between this
and the forme 8. Acres, which is 6. & 67. 100. and this ftands
againft 1. in the fixed, which reprefents 10. his fcale, but 8. in
the moveable gives 12. in the fixed, and fuch were the parts
in an Inch of the fcale fought for.

Ham.

How to extract the Square Root by the Grammelogia.

Construction. LET 1. in the fixed stand toward you, and seeke that number to be extracted in the moveable, if it have 1. 3. 7. or 9. places, &c. bring the number towards the left side of 1. in the fixed: but if the number have 2.4.6. or 8.places,&c. bring it twards the right side of the fixed 1. and move your number to and fro, untill 1. in the moveable bee as farre distant from 1. in the fixed, as your given number is from 1. in the fixed: (the equall parts in the Circle *A B* will helpe you in this so the number in the moveable right against the fixed 1. is the Root sought for.

Here note that 1. or 2. figures hath but one figure for his Root, 3. or 4. figures hath 2. figures or places for its Root, 5. or 6. figures hath 3. figures for its Root, &c.

How to extract the Cubicke Root.

☞ VPon the moveable there are those letters *A. B. C.* the distance betweene *A. B.* is divided into 10. equall parts, and each part subdivided: the distance betweene *A.C.B.* is also divided into 10. parts, and each part subdivided, their uses may be thus.

Construction. Let 1. in the fixed stand alwaies betweene *A* and *B* in the moveable for the *Extraction of Cubicke Roots*, and move the moveable to and fro, untill that the given number and 1. in the fixed be of like number of parts distant from *A* in the moveable.

So if the given Number have $\begin{cases} 1.4.7. \text{ or } 10. \\ 2.5.8. \text{ or } 11. \\ 3.6.9. \text{ or } 12. \end{cases}$ Places, &c. the Cubicke Root is right against $\begin{cases} A \\ C \\ B \end{cases}$ In the fixed.

And here note that a number of 1. 2. or 3. places hath but 1. figure for the Root; a Number which hath 4. 5. or 6. places hath but 2. figures or places for its Root; a number which hath 7. 8. or 9. places hath but 3. figures or places for its Root, &c.

Vses upon the square Root.

There are two square formes, the one is 12. every way, and the other 16. every way, if of those two were made one, how many should it be every way in the side.

BY the first proportion, pag. 16. finde a number in continuall proportion to 16. as 12. to 16. facit 21. & 3. 10. adde this to 12. facit 33. and 3. 10. Then by 1. Pro. pag. 17. finde a meane proportion betweene that 33. and 3. 10. and 12. facit 20. the side of the Square required.

Otherwise square and 12. and 16. according to the eighth example, pag. 15. facit 144. and 256. the summe of those Squares is 400. and the Root Quadrat of it by Pro. 1. pag. 18. is 20. as before, those extractions serve to wonderfull uses in finding the Diagonals of Rectangles, the Diameters and Axis of Solids, the Area, Difference or Aggregate of Figures, as well plaine as solid.

Otherwise we might apply the Pro. thus, *AB* is the bredth of a ditch 16. foot, *B C* the heigh of a wall 12. foot, the length of a scaling Ladder to reach from *A* to *C*. would bee as before 20.

A and *C* are two Townes, *A* lies West of the Meridian of *C* 16. miles, and *C* lies North of the Parallel of *A* 12. miles, the distances of the two Townes would bee as before 20. miles, &c.

Pro. 4. *How to encampe horse or foot, according to any proportion assigned.*

240. men or horse are to be imbatled, that the Flanke to the Front shall be in proportion, as 3 to 5. how many shall be in the Front, and how many in the Flanke.

Bring 3. to 5. so against 24. in the moveable is 400. in the fixed, the square Root of which is the Front viz. 20. divide the said 240. by the Front, 20. the Quotient is 12. the Flanke.

In mentall reservation of a number, to finde that number.

Let the number be broken into two parts, and to the product of the parts adde the square of the halfe the difference of the parts, the Root, Quadrate of the Agragate is halfe the number conceived, &c.

Further uses upon the Grammologia in the resolution of Questions, touching Interest, Purchases, valuation of Leases, and such like.

☞ NOte that from 1. in the moveable, there is charactered 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. &c. all of equall distances, those serve for the number of yeares as occasion requires.

Pro. 1.   Pro. 1. *To finde what a summe of money comes to, at the end of any number of yeares, accounting 8. li. for 100 p r Annum.*

Declaratio.   So if 20. li. were forborne 12. yeares, how much doth it come to allowing Interest compound at 8. li. for 100. li.

Constructio.   Bring 1. in the moveable to 20. in the fixed, so right against 12. yeares in the moveable you have 50. li. 4. 10. in the fixed. And so much will 20. li. amount to being forborne 12. yeares.

☞   The Instrument not removed, you may at one instant see the amount of the said 20. li. for any number of yeares or parts of a yeare; for right against the time in the moveable, you have the answer of the money in the fixed.

Pro. 2.   Pro. 2. *To finde what a summe of money which is due any number of yeares to come, is worth in ready mony, allowing 8. li. for 100. li.*

Declaratio.   So if the said 20. li. were due 12. yeares hence, what is it worth in Present.

Constructio.   This is only the converse of the former : bring therefore 12. yeares in the moveable to 20. in the fixed, so right against 1. in the moveable is 7. li. 94. 100. in the fixed, which is about 7. li. 18. s. 3. d. and so much is able to buy the said 20. li. to be received 12. yeares hence.

Pro. 3.   Pro. 3. *A yearly Rent of a Lease, or a Pension to be sold for any number of yeares, to finde the worth thereof in ready money : Or the Rent for any number of yeares being unpaid, to finde what it amounts unto, accounting 8. li. for 100. li.*
per Annum.

Declaratio.   Let a Lease or Pension of 20. li. *per Annum* be sold for ready mony, which is in being 12. yeares, how much is it worth ?

Constructio.   Bring 8. to 100. then right against 20. li. in the moveable is 250. li. in the fixed ; unto this 250. in the fixed bring 12. yeares; so right against 1. in the moveable is 99. li. 3. 10. in the fixed, which taken out of the said 250. there remaines 150. li. 7. 10. the worth required.

If the Rent were behind unpaid 12 *yeares.*

THen bring 1. to the said 250. so right against 12. yeares in the moveable is 630. li. in the fixed, take the former 250. from this 630. li. it leaves 380. li. and so much doth the said Rent of 20. li. *per Annum* amount to forborne 12. yeares at 8. li. for 100. li. *per Annum.*

Pro. 4. *A summe of money borrowed, and a Lease ingaged for that*   **Pro. 4.**
      money, to finde how long the Lease ought to be kept.

Let 300. li. be borrowed upon a Lease in being 20. yeares,   **Declaratio.**
of 50. li. a yeare, how long shall the Rent be received, that neither be damaged one by the other, accounting 8. li. for 100. li. *per Annum.*

Bring 8. to 100. so right against 50. in the moveable is   **Constructio.**
625. in the fixed: from this 265. li. subtract the mony bor-   **625**
rowed, *viz* 300. li. it leaves 325. li. then bring 1. to this 325. in the fixed; so right against the same 625. in the fixed, is 8. yeares 5 10. in the moveable, and so long time shall the Len-der of the Money enjoy the Borrowers Lease, after 8. li. for 100. li. *per Annum.* This may be inverted, knowing the Summe and time to finde the Rent.

Pro. 5. *A Lease to beginne for yeares to come, and then to continue*   **Pro. 5.**
      for any number of yeares, to finde the worth thereof
        in present, accounting Interest Compound
          at 8. li. for 100. li. per Annum.

Let a Lease of 40. li. *per Annum* beginne 7. yeares hence,   **Declaratio.**
and then to continue 10. yeares after; if it were to bee sold, what is it worth in ready money ?

By the third *Pro.* finde the worth thereof in the present   **Constructio.**
for the 10. yeares, *facit,* 268. li. 4. 10. then by the second *Pro.* finde what that 268. li. 4. 10. is worth in present if it were to be received 7. yeares hence, *facit,* 156. li. 6. 10. and so much is the said Lease of 40. li. *per Annum* worth, which is to beginne 7. yeares hence, and then to continue unto 10. yeares.

Thus I might have gone further in those matters, but I intended not to be large in this Tract, onely shewing what weighty, and difficult matters in this kinde by the *Grammelogia,* or *Mathematicall Ring,* may bee easily and speedily resolved.

                            Conclusio.

Conclusion.

C

IF there be composed three *Circles* of equal thicknesse, A, B, C, so that the inner edge of D and the outward edge of A bee answerably graduated with *Logarithmall signes*, and the outward edge of B and the inner edge of A with *Logarithmes*, and then on the backside be graduated the *Logarithmall Tangents*, and againe the *Logarithmall signes* oppositely to the former graduations, it shall be fitted for the resolution of *Plaine* and *Sphericall Triangles*.

Example.

So if you move the *Signe* of 90. Degrees vnto the *Tropicall point* in the fixed, you have the *Declination* of any Degree of the *Eclipticke* onely by an *ocular inspection*, for right against the *Sunnes longitude* in the moveable amongst the *Signes*, is the *Sunne declination* in the fixed.

Againe, in the Line of *Tangents*, if you bring the *complement* of any *Latitude* in the moveable to 45. in the fixed, you may at one instant have the time of *Sun rising* or *Sun setting* for any *Declination* required in that *Latitude*; for right against the *Tangent* of the *Suns Declination*, you have the sine of the *Suns ascentionall difference*: and in plaine *Triangles* the operations are performed with like facility.

Hence from the forme, I have called it a *Ring*, and *Grammelogia* by annoligie of a *Lineary speech*; which *Ring*, if it were projected in the *Convex* vnto two yards *Diameter*, or thereabouts, and the line *Decupled*, it would worke *Trigonometrie* vnto seconds, and give *proportionall numbers* vnto six places, onely by an *ocular inspection*, which would compendiate *Astronomicall calculations*, and be sufficient for the *Prostaphæresis* of the Motions: But of this as God shall give life and ability to health and time.

FINIS.

This *Instrument* is made in Silver, or Brasse for the Pocket, or at any other bignesse, over against Saint *Clements Church* without *Temple Barre*, by *Elias Allen*.
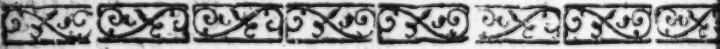
CHARLES *by the grace of God*, King of Great-Britaine, France, *and* Ireland, *Defender of the Faith, &c. To all our loving Subjects whom it may concerne greeting: Whereas* Richard Delamain, *Teacher of the* Mathematicks, *hath presented vnto Vs an* Instrument *called* Grammelogia, *or* The Mathematicall Ring, *together with a Booke so intituled, expressing the vse thereof, being his owne* Invention; *we of our Gracious and Princely favour have granted vnto the said* Richard Delamain *and his* Assignes, *Privilege, Licence, and Authority, for the sole Making, Printing, and Selling of the said* Instrument *and* Booke: *straightly forbidding any other to Make, Imprint, or Sell, or cause to be Made, or Imprinted, or Sold, the said* Instrument *or* Booke *within any our* Dominions, *during the space of* ten yeares *next ensuing the date hereof, vpon paine of* Our high displeasure. *Given vnder our hand and Signet at our Palace of Westminster, the fourth day of* Ianuary, *in the sixth yeare of our Raigne.*
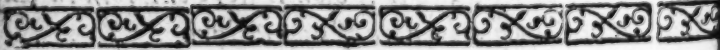
Vpon his Ring.

AS in a secret *Circle* wrapt lies natures *mysteries*,
    Which time brings forth, & industry makes plaine to all mens eye:
So that what erst was hard to finde, at length is wrought with ease,
Rules of *Proportion*, the *Roots Extraction*, and these
With ocular inspection now: Also *Triangles* Plaine
And Sphæricall; for *Questions* soone an *Answer* to obtaine;
That it makes *Arts* laugh his quicknesse to see, then use this *Ring*,
The *Circle* where, hid *Arts* lie now themselves discovering.
If after times shall seeke more ease than in this easinesse
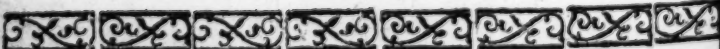By *Instrument*, he makes *Arts* lame, with eases great excesse.

By a Friend.

THe *Ægyptian Sages*, who were wont to sing
    In the *Hieroglyphicks*, their Philosophie;
Portrai'd the yeare in semblance of a *Ring*,
    Cause so the yeare round in it 'elfe doth lie.
    Thy *Mathematicke Ring* is more profound,
    A world of Art lies in that little Round.

FINIS.

A

eye

Attr.
V